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Isotopic (Sm–Nd, Pb–Pb, and $\delta^{34}S$) and Geochemical Characteristics of the Metasedimentary Rocks of the Baikal–Patom Belt (Northern Transbaikalia) and Evolution of the Sedimentary Basin in the Neoproterozoic

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Abstract—This paper reports the results of a detailed isotopic (Sm–Nd, Pb–Pb, and $\delta^{34}S$) and geochemical studies of Neoproterozoic metasedimentary rocks from the Patom and Bodaibo domains of the Baikal–Patom belt (northern Transbaikalia). It was shown that the metasedimentary rocks of these domains are strongly variable in their geochemical and isotope geochemical characteristics. Regular variations in these characteristics were observed, and their correlation with the main stages of the evolution of the sedimentary paleobasin in the Neoproterozoic was established.

Keywords: Baikal–Patom belt, metasedimentary rocks, Nd, Pb, and S isotope composition, provenance, sedimentation conditions

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INTRODUCTION

The Neoproterozoic period is of special significance in geological history. The interest of researchers to it is related to the fact that a number of planetary-scale events took place during that time (formation and destruction of the Rodinia supercontinent, Snowball Earth glaciation, appearance of Ediacaran biota in the ocean, etc.), which considerably influenced the global evolution of the Earth. Events of this time period are still not adequately known. The study of Neoproterozoic geologic processes is based primarily on the determination of the geochemical and isotopic characteristics of sedimentary rocks. This allows one to identify provenances for paleobasins and reconstruct the physicochemical and geotectonic conditions of sedimentation.

The Transbaikalian fold-and-thrust belt is one of a few regions where an almost complete stratigraphic section of Neoproterozoic metasedimentary rocks can be observed. Its investigation over almost half a century have provided insight into the stratigraphy of sedimentary sequences and resulted in the development of regional correlation schemes. In addition, the timing of sedimentation processes was reliably constrained. The results of this work served as a basis for the development of models for the Neoproterozoic history of the region (Zhmodik et al., 2006; Zorin et al., 2009; Nemerov et al., 2010; etc.). The problems of the source of clastic material in the paleobasin and sedimentation conditions are still debatable. Recent U–Pb dating of detrital zircon showed that the terrigenous component of the sedimentary sequences of the Baikal–Patom belt was produced by the destruction of rock complexes of widely ranging ages, from the Late Archean to the Neoproterozoic (Yudovskaya et al., 2011; Gladkochub et al., 2013; Powerman et al., 2015). The suggestion that several sources with different geochemical characteristics could contribute to the sedimentation process was also supported by the results of reconnaissance Sm–Nd measurements reported for rocks from some stratigraphic units (Rytsk et al., 2011; Dubinina et al., 2014; Chugaev et al., 2017).

Our study was aimed at detailed geochemical and isotopic characterization of metasedimentary sequences